Central Arizona Project
Yuma Area Efforts Update

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Central Arizona Project

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CAP's Goals for Yuma Area Desalination/GW Investigations

- Provide new information to support the Governor's Water Augmentation Council (GWAC) Desalination Committee discussions
- Facilitate discussions to reduce system losses impacting Lake Mead
- Support efforts to reduce the risks of shortage on the Colorado River system
- Support efforts to develop new water supply opportunities, only with and through the cooperation of local interests and Reclamation

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Summary of Investigations

- Central question:
  - What is the range of opportunities to develop brackish groundwater under Yuma Mesa (aka the Mound) as a new water supply resource through desalination?
- Investigation Components:
  - Groundwater model to estimate the potential sustainable yield of groundwater extraction beneath the Mound (B&V Study)
  - Extraction well field and conveyance, and desalination process conceptual design (CH2M Study)
- Summary of Results:
  - Sustainable yield of Mound ~ 50 kaf/yr
  - Extraction and brackish groundwater desalination ~$550/af
  - Opportunity for local delivery and exchange

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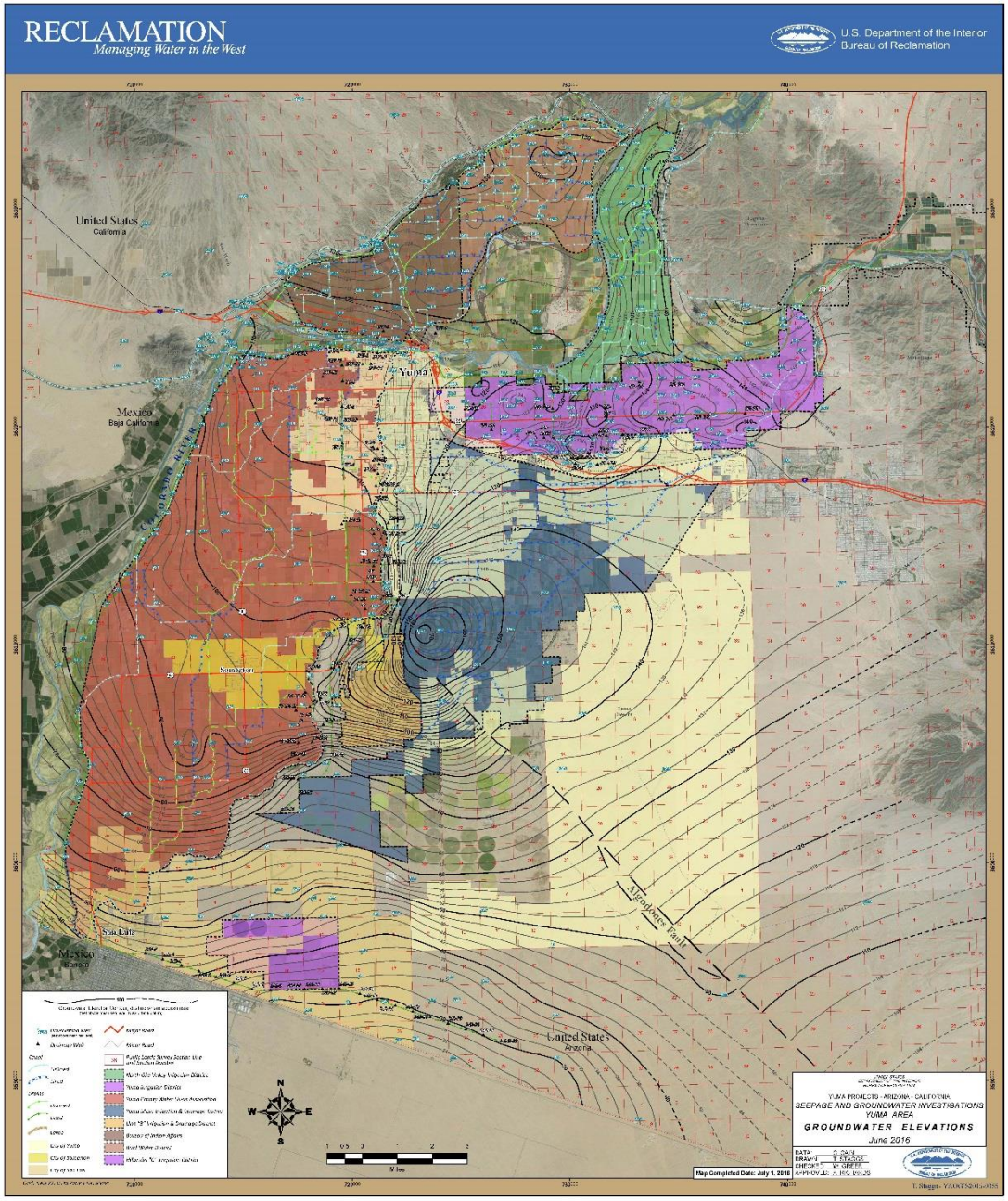
RECLAMATION
Managing Water in the West
U.S. Department of the Interior
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San Luis
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YUMA PROJECTS - ARIZONA - CALIFORNIA
SEEPAGE AND GROUNDWATER INVESTIGATIONS
YUMA AREA
GROUNDWATER ELEVATIONS
June 2016
Map Completed Date: July 1, 2016

Background "The Mound" Well Field

- High GW resource beneath Yuma Mesa
- Related to irrigation in the vicinity of Yuma Mesa
- Contributes to high GW in the Yuma Valley
- Location & extent of the mound related to local geologic features
- Identified as potential "resource" in 2005
- 2010 & 2011 Pilot Test – WQIC (CRADA - tested brackish GW desalination)
- Yuma Desalting Plant Long-Term Operational Alternative Summary Report. Aug. 2013
- B&V 2014 (Augmentation Study) & 2016 (GW model)
- CH2M 2017 (Pre-feasibility)

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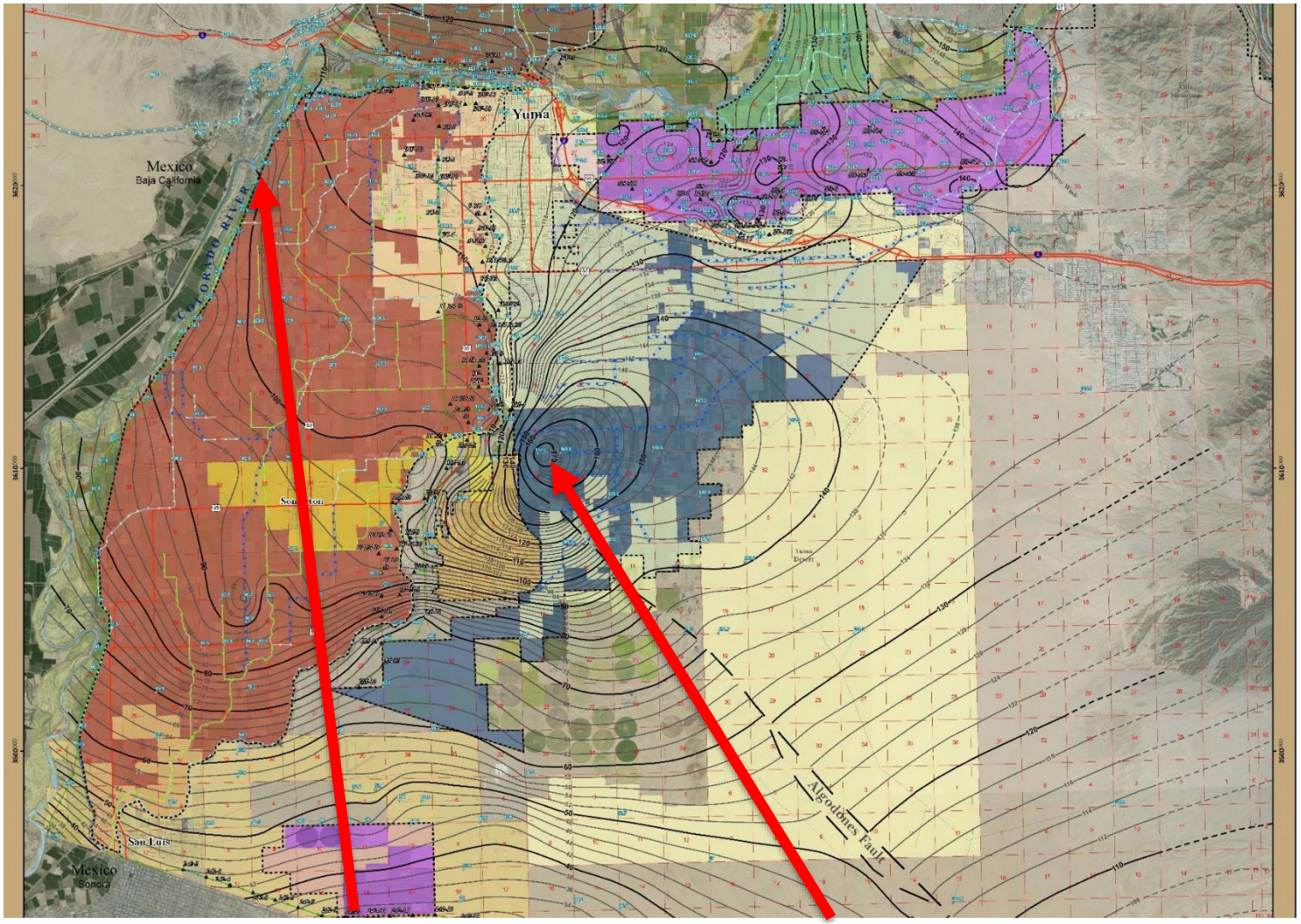
Yuma Area GW Elevations



Morelos Dam
(112 ft amsl)
GW ~10-12 ft bgs

Yuma Mesa
(213 ft amsl)
GW ~40 ft bgs

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Well Field (Cont.)

Black & Veatch, 2016 (MODFLOW)

- Estimated Yuma Mesa GW Mound volume = 600 KAF (*USGS, 2006*)
- 30-40 extraction wells
- Average extraction rate of 1,000-1,100 gpm
- 50,000 AF/yr on a sustainable basis

CH2M, 2017 (Pre-feasibility study: COST)

- 19 extraction wells
- Extraction rate revised to 2,000 gpm (USBR)
- 50,000 AF/yr yield
- Conceptual well field site

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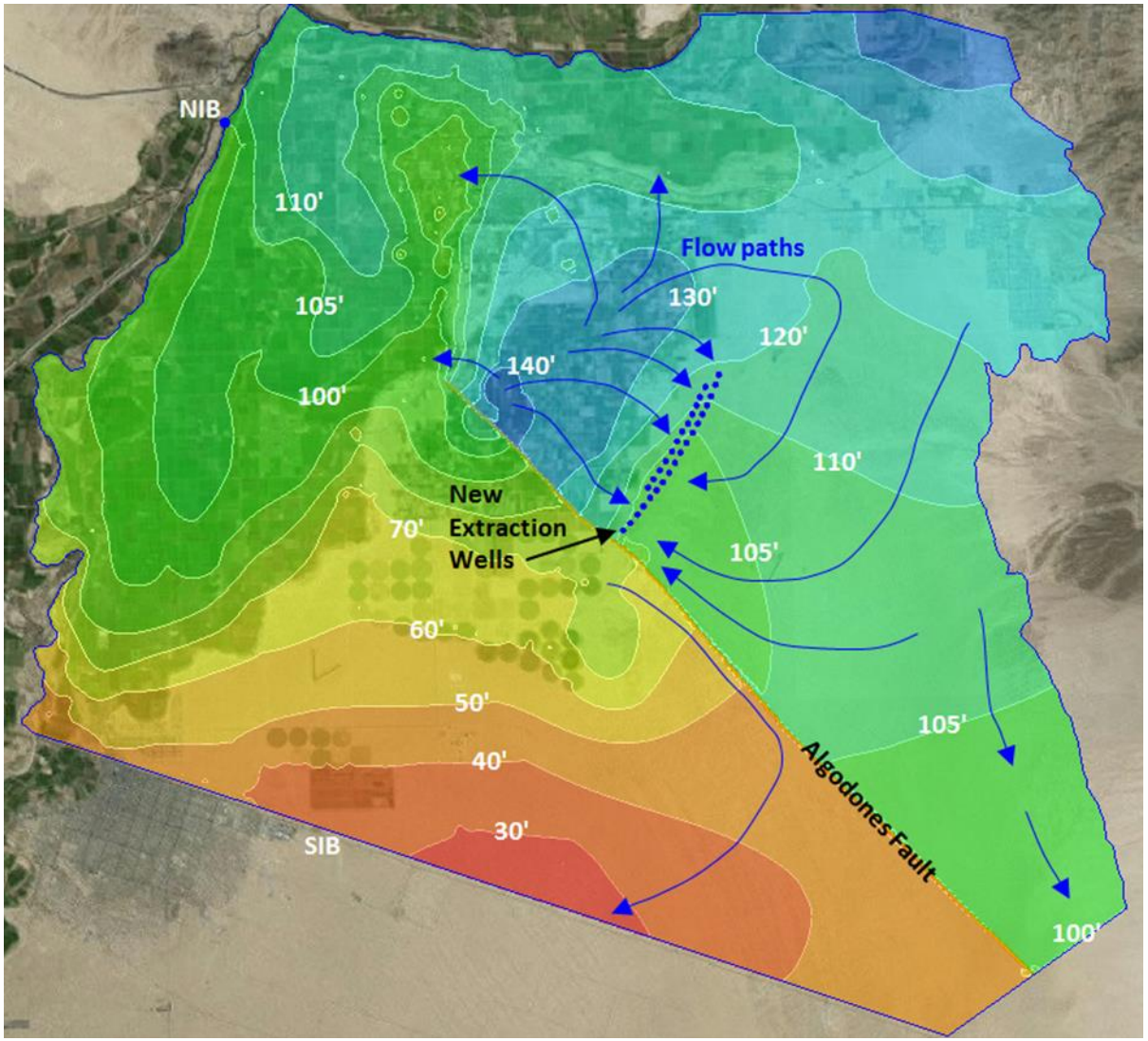
Transient Test Modeling results



Modeled GW Elevations and Flow Paths for Proposed Conditions with 30 New Extraction Wells SE of Mound

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Options Explored in the CH2M Study

- **Extraction**
  - Potential wellfield configurations (2)
  - Utilized local data on drainage well production *rates*, and irrigation well pump *capacity*
  - Locations adjacent to GW mound
- **Conveyance**
  - Potential pipeline alignments (3)
  - Right-of way constraints & opportunities
- **Conceptual Treatment Process**
  - Utilize existing YDP facility
  - New treatment train at YDP
  - WQ from Reclamation monitoring wells (YM-3R & YM-4)

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Concept

- **Extraction**
  - **Wellfield Option 1 (adj. to airport, N of mound)**
  - **Wellfield Option 2 (brackets mound apex)**
- **Conveyance**
  - **Yuma Mesa Conduit Alignment**
  - **“Open Country” Alignment**
  - **East Main Canal Alignment**
- **Treatment**
  - **YDP mods/pre-treatment**
    - **Source: Yuma Mesa GW**
    - **Optimizing existing YDP facilities for treatment of Yuma Mesa GW**
    - **Open vs closed system (oxic vs anoxic)**

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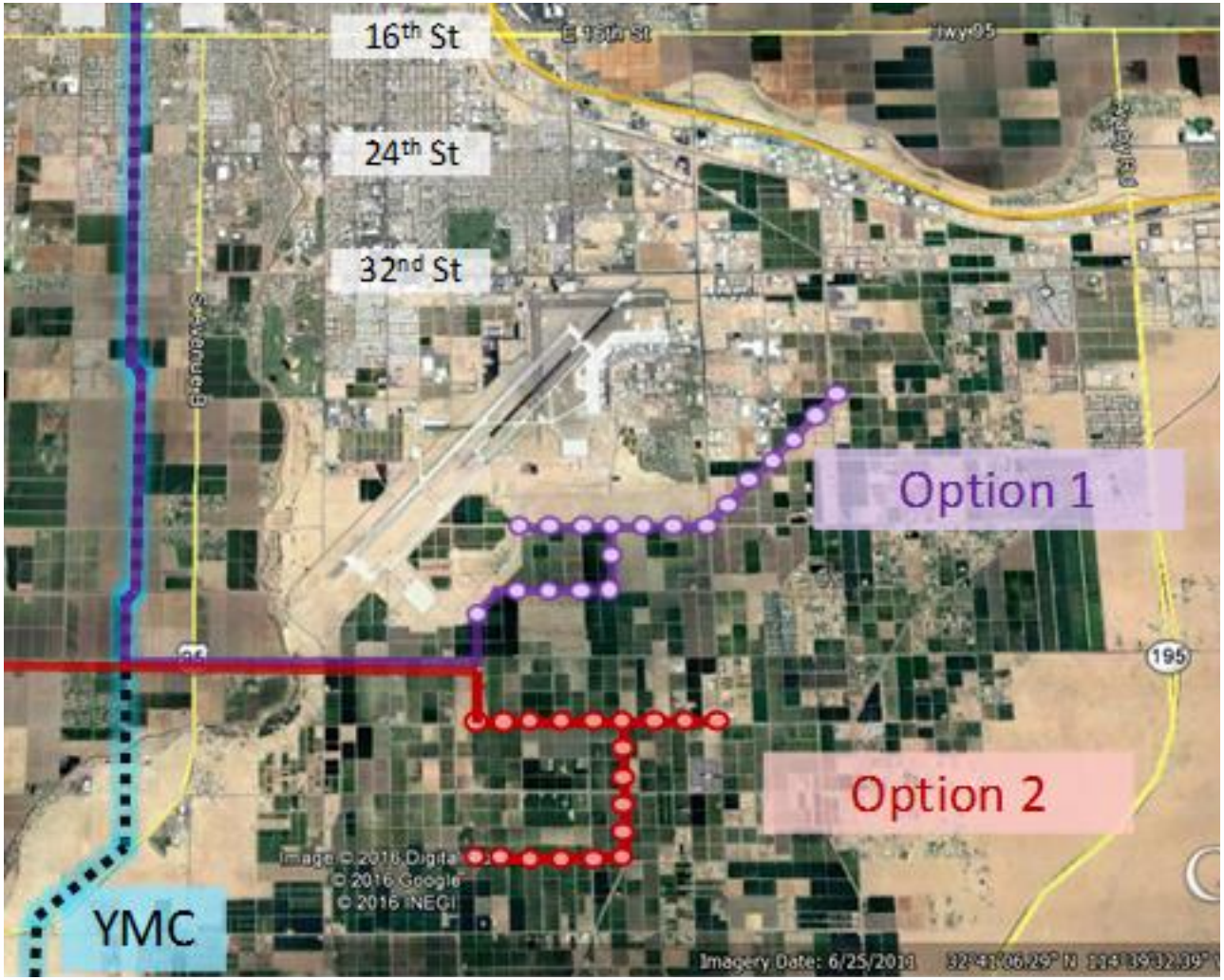
Wellfield Options



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Conveyance Options

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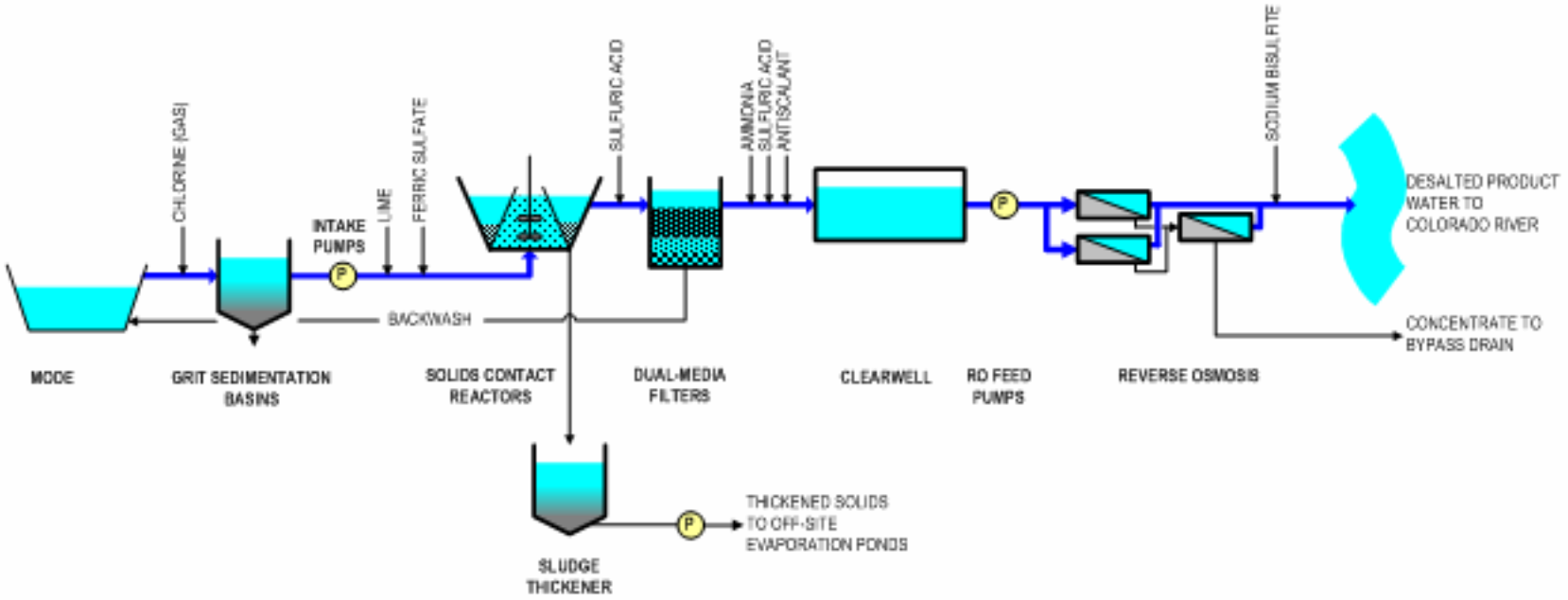
Treatment

- **Existing**



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Treatment Considerations

- Utilize existing facilities if/when possible
- YDP source flexibility
- Capital + Annual OM costs

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Conceptual Treatment Design

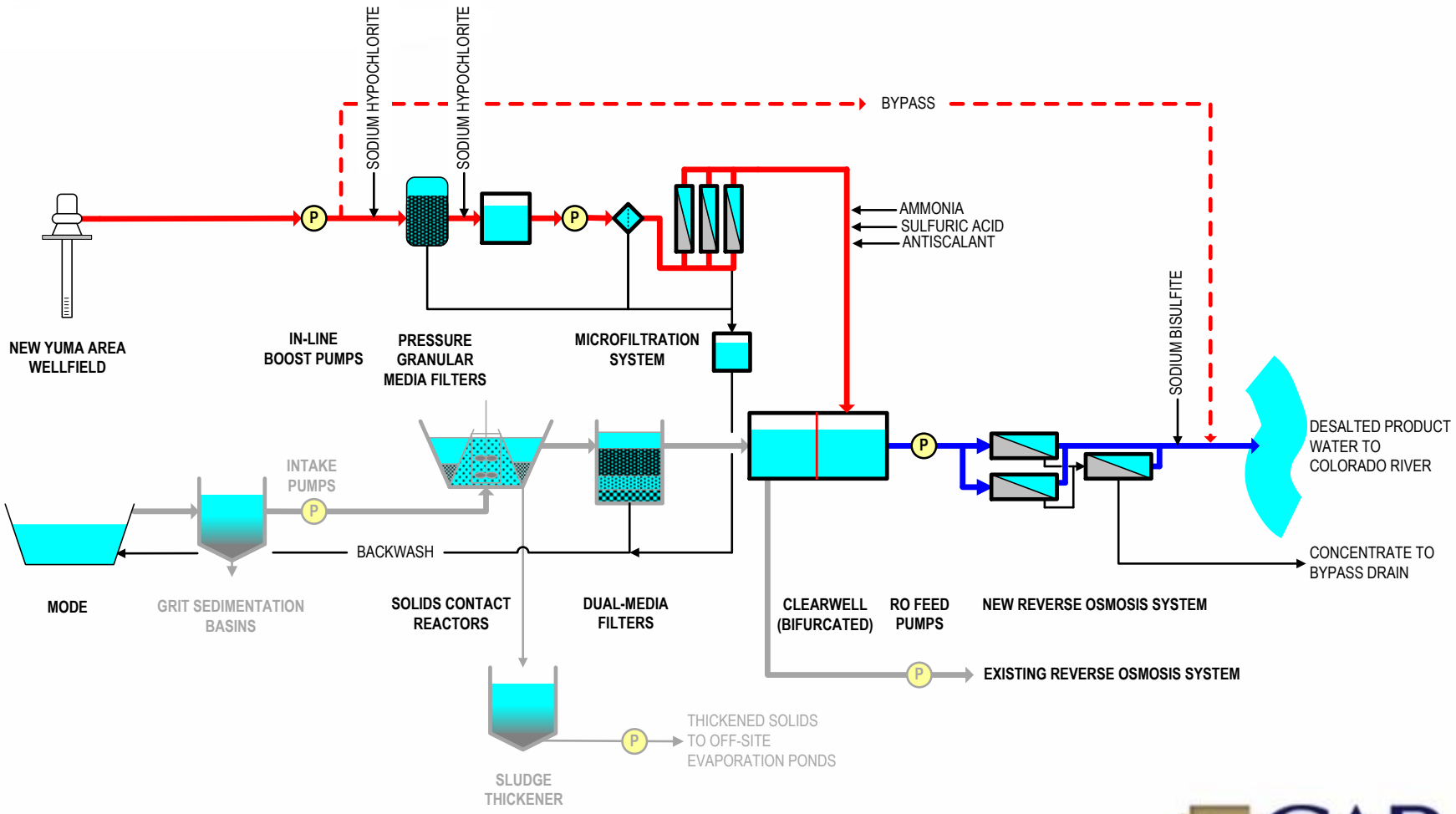

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Table ES-1. Cost Summary Table

Description	Alternative 1 – Yuma Mesa Conduit Alignment	Alternative 2 – Open Country Alignment	Alternative 3 – East Main Canal Alignment
Annual Yield (ac-ft/yr)	42,865	42,865	42,865
Construction Cost	$161,409,000	$155,936,000	$156,746,000
Annual O&M Cost	$16,098,000	$15,968,000	$15,987,000
Net Present Value	$479,350,000	$471,310,000	$472,495,000
Construction Unit Water Costs ($/ac-ft)	$169	$163	$164
Annual O&M Unit Water Cost ($/ac-ft)	$376	$373	$373
Total Unit Water Cost ($/ac-ft)	$545	$536	$537

Notes:
All costs are presented in April 2017 dollars.
All costs were prepared in accordance with AACE International Class 4 standards, for which the estimated accuracy range is from -30 to +50%.
Nonconstruction costs for permitting, engineering, services during construction, legal, administration, and right-of-way acquisition are excluded.
Net present value was based on an annual discount rate (i) of 5 percent, annual inflation rate of 2 percent, over a period (n) of 30 years.
Unit water costs were prepared based on an annual yield of 42,865 ac-ft/yr at the YDP based on an overall system recovery of 85 percent (including bypass) to produce a final product water with TDS less than 750 milligrams per liter. Unit costs were also prepared using a capital recovery (A/P) = 0.0446 where A is the equivalent annual investment and P is the initial investment. Capital recovery is calculated using the following equation: $\frac{A}{P} = \frac{i(1+i)^n}{(1+i)^n-1}$.

Summary of the Investigation

- **Brackish GW under Yuma Mesa**
- **50,000 AF/yr**
- **Total (blended) supply for exchange at a unit cost of ~$550/AF**

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Potential Next Steps

- **Outreach**
  - Sharing results of investigation
  - Discussions with local interests
  - Explore funding options
- **Potential Additional Study**
  - Aquifer testing
  - Pilot test
    - Phase 1 (RO pre-treatment)
      - Cartridge filtration only
      - Oxidation and cartridge filtration
      - Oxidation and membrane microfiltration
    - Phase 2
      - RO unit testing

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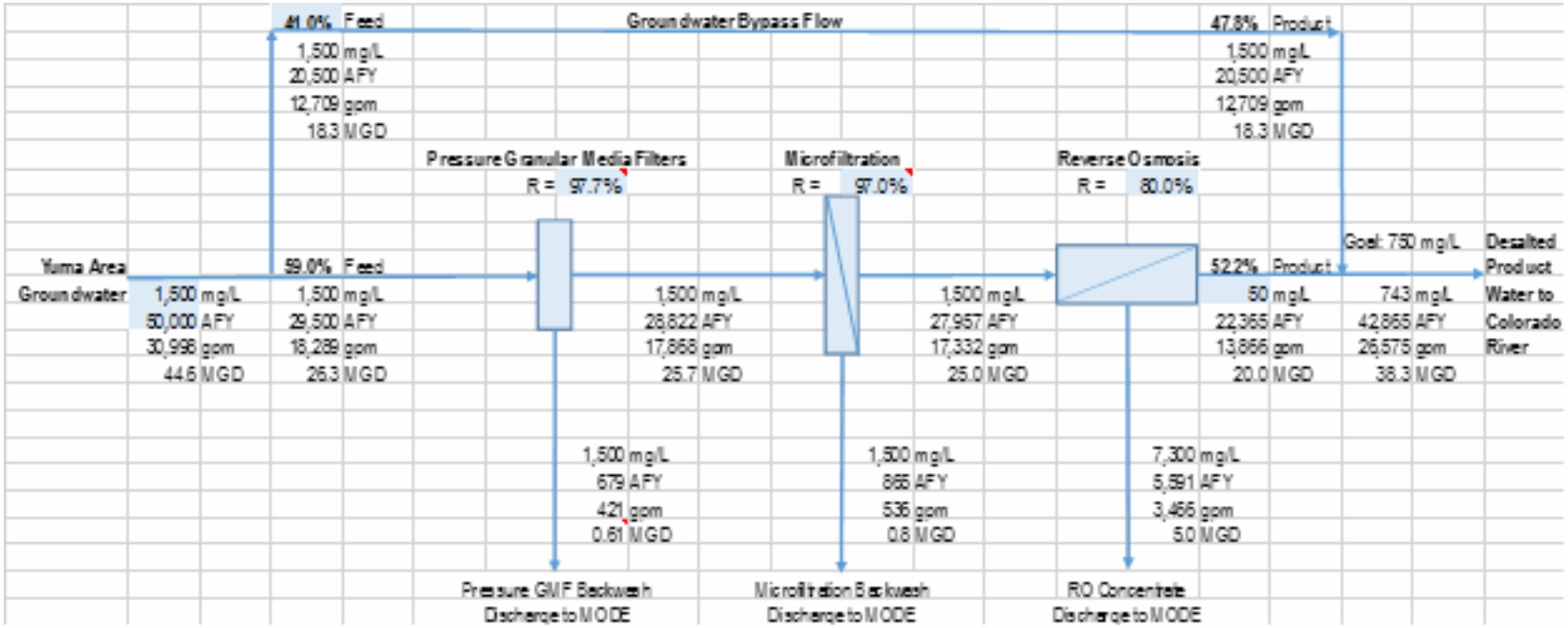
PROTECT
LAKE MEAD

Mass Flow Salinity Balance for YDP



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